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國立臺北科技大學 106 學年度碩士班招生考試

系所組別：4100 工業工程與管理系碩士班

第一節　統計學　試題

注意事項：
1. 本試題共三大題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

Part I. True/ False (3 points for each question with total 15 points.)

1. The rejection region for a hypothesis test becomes smaller if the level of significance is changed from 0.01 to 0.05.
2. A major limitation of nonrandom samples is that they are not appropriate for most statistical methods.
3. A population list, map, directory, or other source used to represent the population from which a sample is taken is called the census.
4. If the population is normal and its standard deviation, σ, is known but the sample size is small, z-distribution values may not be used to determine interval estimates for the population mean.
5. Generally speaking, the hypotheses that business researchers want to prove are stated in the alternative hypothesis.

Part II. Multiple Choice (Choose the best answer for each question. 3 points for each question with total 30 points.)

1. What type of error occurs if you fail to reject H_0 when, in fact, it is not true?
   a. Type II
   b. Type I
   c. either Type I or Type II, depending on the level of significance
   d. either Type I or Type II, depending on whether the test is one tail or two tail
2. In computing the standard error of the mean, the finite population correction factor is used when
   a. $N/n > 0.05$
   b. $N/n \leq 0.05$
   c. $n/N > 0.05$
   d. $n/N \leq 30$
3. In interval estimation, the t distribution is applicable only when
   a. the population has a mean of less than 30
   b. the sample standard deviation is used to estimate the population standard deviation
   c. the variance of the population is known
   d. the standard deviation of the population is known
4. A simple random sample from an infinite population is a sample selected such that
   a. each element is selected independently and from the same population
   b. each element has a 0.5 probability of being selected
   c. each element has a probability of at least 0.5 of being selected
   d. the probability of being selected changes
5. As the number of degrees of freedom for a t distribution increases, the difference between the t distribution and the standard normal distribution
   a. becomes larger
   b. becomes smaller
   c. stays the same
   d. None of these alternatives is correct.
6. In hypothesis testing if the null hypothesis has been rejected when the alternative hypothesis has been true,
   a. a Type I error has been committed
   b. a Type II error has been committed
   c. either a Type I or Type II error has been committed
   d. the correct decision has been made
7. The bottler of a certain soft drink claims their equipment to be accurate and that the variance of all filled bottles is 0.05 or less. The null hypothesis in a test to confirm the claim would be written as
   a. $H_0: \sigma^2 \geq 0.05$
   b. $H_0: \sigma^2 > 0.05$
   c. $H_0: \sigma^2 < 0.05$
   d. $H_0: \sigma^2 \leq 0.05$
8. If we are interested in testing whether the proportion of items in population 1 is larger than the proportion of items in population 2, the
   a. null hypothesis should state $P_1 - P_2 < 0$
   b. null hypothesis should state $P_1 - P_2 > 0$
   c. alternative hypothesis should state $P_1 - P_2 > 0$
   d. alternative hypothesis should state $P_1 - P_2 < 0$

注意：背面尚有試題

9. To construct an interval estimate for the difference between the means of two populations when the standard deviations of the two populations are unknown and it can be assumed the two populations have equal variances, we must use a t distribution with (let n_1 be the size of sample 1 and n_2 the size of sample 2)
   a. $(n_1 + n_2)$ degrees of freedom
   b. $(n_1 + n_2 - 1)$ degrees of freedom
   c. $(n_1 + n_2 - 2)$ degrees of freedom
   d. $(n_1 - n_2 + 2)$ degrees of freedom
10. In hypothesis testing if the null hypothesis is rejected,
   a. no conclusions can be drawn from the test
   b. the alternative hypothesis is true
   c. the data must have been accumulated incorrectly
   d. the sample size has been too small

Part III. Calculation (total 55 points.)

1. Lori Jeffrey is a successful sales representative for a major publisher of college textbooks. Historically, Lori obtains a book adoption on 25% of her sales calls. Viewing her sales calls for one month as a sample of all possible sales calls, assume that a statistical analysis of the data yields a standard error of the proportion of 0.0625. **(15 points)**
   a. How large was the sample used in this analysis? That is, how many sales calls did Lori make during the month?
   b. Let $\bar{p}$ indicate the sample proportion of book adoptions obtained during the month. Show the sampling distribution of $\bar{p}$.
   c. Using the sampling distribution of $\bar{p}$, compute the probability that Lori will obtain book adoptions on 30% or more of her sales calls during a one-month period.

2. A blackjack player at a Las Vegas casino learned that the house will provide a free room if play is for four hours at an average bet of $50. The player's strategy provides a probability of .49 of winning on any one hand, and the player knows that there are 60 hands per hour. Suppose the player plays for four hours at a bet of $50 per hand. **(15 points)**
   a. What is the player's expected payoff?
   b. What is the probability the player loses $1000 or more?
   c. What is the probability the player wins?
3. random sample of final examination grades for a college course follows:

   55 85 72 99 48 71 88 70 59 98 80 74 93 85 74
   82 90 71 83 60 95 77 84 73 63 72 95 79 51 85
   76 81 78 65 75 87 86 70 80 64

   Use $\alpha = 0.05$ and test to determine whether a normal distribution should be rejected as being representative of the population's distribution of grades. **(10 points)**

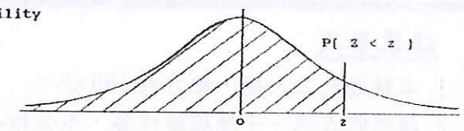
4. Airline passengers arrive randomly and independently at the passenger-screening facility at a major international airport. The mean arrival rate is 10 passengers per minute. **(15 points)**
   a. Compute the probability of no arrivals in a one-minute period.
   b. Compute the probability that three or fewer passengers arrive in a one-minute period.
   c. Compute the probability of no arrivals in a 15-second period.

STANDARD STATISTICAL TABLES

1. Areas under the Normal Distribution

The table gives the cumulative probability up to the standardised normal value z
i.e.

$$P[\,z < z\,] = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp(-\tfrac{1}{2}z^2)\, dz$$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5159	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7854
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8804	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9773	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9865	0.9868	0.9871	0.9874	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9924	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9980	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
z	3.00	3.10	3.20	3.30	3.40	3.50	3.60	3.70	3.80	3.90
P	0.9986	0.9990	0.9993	0.9995	0.9997	0.9998	0.9998	0.9999	0.9999	1.0000

Percentage Points of the Chi-Square Distribution

Degrees of Freedom	Probability of a larger value of x^2								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09
6	0.872	1.635	2.204	3.455	5.348	7.84	10.64	12.59	16.81
7	1.239	2.167	2.833	4.255	6.346	9.04	12.02	14.07	18.48
8	1.647	2.733	3.490	5.071	7.344	10.22	13.36	15.51	20.09
9	2.088	3.325	4.168	5.899	8.343	11.39	14.68	16.92	21.67
10	2.558	3.940	4.865	6.737	9.342	12.55	15.99	18.31	23.21